ENGLISH TRANSLATION

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AVOIDING MALFUNCTIONS IN MEDIA GATEWAY CONTROLLERS OR MEDIA GATEWAYS

The invention relates to methods and devices for changing the coding of (at least) one load data connection section termination at a media gateway of a media gateway controller at the media gateway.

ITU-T protocols H.248 and Q.1950 specify the control of what are known as "Media Gateways"
(=MGWs especially in a cellular mobile radio network or fixed network) by what are known as media gateway controllers (MGCs). Protocol Q.1950 "Bearer independent Call Bearer Control Protocol" (CBC) is used in conjunction with the BICC protocol Q.1902.4 already specified by the ITU-T. These protocols can also be used for 3GPP applications Media Gateways perform functions such as the connection of load connection sections (for transmission of load data such as voice, text, multimedia data) of a telecommunications network, and where necessary convert between various codings, for example voice codings such as G.711 or AMR. In this document load connection section termination or termination for short is taken to be the termination of a section of a network connection switched through the MGW e.g. for voice or multimedia (sound and picture) at this MGW. Through this termination the MGW sends and/or receives (load) data belonging to the load connection. In voice usage of protocols

H.248 and Q.1950 a load connection section termination corresponds to a "termination".

The above-mentioned protocols allow existing load connections to be changed, by selecting another coding for example. The signaling used between MGC and MGW (protocols H.248 and Q.1950) is designed so that each termination in the MGW is changed independently of the other terminations connected with it within the MGW. For example the MGW can be instructed to use another coding at this termination, or to transmit and/or receive no data (=deactivation of this termination at the MGW = isolation of this termination at the MGW). The MGW does not know when changing a termination whether other terminations connected by it to this termination will subsequently be changed. Therefore the MGW, when changing a termination must immediately take measures if with connected terminations (in voice usage of protocols H.248 and Q.1950 terminations connected to each other within an MGW are in what is known as a shared "context".) different codings are produced and must use what is known as transcoding to convert these into one another. In special cases however the coding of all terminations connected to each other in the MGW which lie in the same "context" should be changed almost simultaneously, for example, within the framework of what is known as BICC "codec modification" or "codec renegotiation" (see Q.1902.4), via which the coding of existing voice connections can be changed. 3GPP also uses said BICC procedures to switch over existing load connections between (the

load data types) voice and multimedia data (i.e. a combination of voice and pictures in a shared coding. The MGC can recognize such situations on the basis of what is known as the "Call Control" signaling, arriving at it, e.g. Q.1902.4. Since the signaling of the MGC occurs sequentially at the MGW, an almost simultaneous switchover of all connected terminations within an MGW results in possibly undesired operating behavior here: The MGW briefly activates a transcoder which is then almost immediately deactivated again. This generates unnecessary operational load in an MGW and reduces its throughput. It would be acceptable, but to date has not been technically possible, to briefly interrupt the connection. In addition the MGW may possibly establish, on changing the first termination, that it cannot convert the new coding of this termination into the coding still used at the other termination(s). This can for example occur if the changeover is to be between a voice connection and a multimedia connection or a general data connection. The MGW in this case therefore rejects the change of the load connection using H.248/Q.1950 signaling.

The object of the present invention is to make possible the most efficient changeover of codings in terminations present at a media gateway on an instruction to the media gateway and to make it possible to switch between codings that the media gateway cannot convert into each other. The object is achieved by the objects of the Independent claims in each case. In that, in accordance with the invention, a media gateway MGW on arrival of a command (to change

the coding of at least one termination of a context at the MGW) waits with testing of the connectibility (of the terminations of this context with new (changed by a command for at least one termination) coding) and if necessary activation of a transcoding until it establishes on the basis of one or more signals arriving at the MGW that it has all current outstanding (that is in particular all not yet already processed) commands for changing codings in terminations of this context available, an unnecessary operating load through a short-term switching on and off of a transcoder (according to the prior art) can be avoided in the MGW. The media gateway MGW establishes that the MGW has available all current commands to be executed (=e.g. all current commands known (or forwarded) to one or more MGC(s) and/or media gateways) for changing coding in terminations of this context. To do this the media gateway uses the signaling in the BICC procedures "Codec Modification" and "Codec Renegotiation" according to Q.1902.4 and Q.1950 unchanged, as previously specified, and also without messages having to be modified. The behavior of the MGW in accordance with the invention as a reaction to incoming Q.1950 messages deviates from the behavior previously specified in Q.1950.

An MGW can establish (decide) on the basis of different further signaling (e.g. 5/7/9 in Fig. 1) that it has all commands available for changing terminations of this context, for example because it has received suitable signaling from the Media Gateway Controller MGC (confirm characteristic 9= confirmed change of the characteristic (here of the coding)), or because it has received,

for the terminations in a context for termination B affected by the first command (2) (in Fig. 1: only termination A) a command for changing the coding of this termination (in Fig. 1: termination A) etc.

A Media Gateway Controller which initiates the changing of a load connection by means of the BICC procedures "Codec Modification" and "Codec Renegotiation" according to Q.1902.4 can simultaneously initiate these procedures in the direction of all branches of the load connection coming together within it. The synchronization of these separate procedures is not currently specified in BICC. A suitable synchronization of the procedures in the MGC is also an object of the invention. Fig. 4: the messages 1 and 2 must be confirmed by the MGW before the MGC transmits the messages 3 and 3a)

The following embodiments in particular are especially advantageous:

1. The sequence of signaling for the BICC procedures "Codec Modification" and "Codec Renegotiation" in accordance with Q.1902.4 is utilized in order to adapt the procedures to the MGW other than in the way described in Q.1950 so that the MGW does not check for any transcoding needed between terminations in a context as well as for the activation of transcoders that may be necessary until the point at which, in the case of a joint modification of a number of terminations, it has already received signaling from the MGC relating to the modification of all terminations.

2. In the case where the MGC uses the Q.1950 "Reserve Characteristics" procedure to cause the MGW to modify a termination, the MGW should only perform the checking and activation of the transcoder when the MGC confirms to the MGW the modification of this termination by means of the Q. 1950 "Confirm Characteristics" procedure.

3. In a preferred embodiment of 2, in the case where the MGC uses the Q.1950 "Reserve Characteristics" procedure to cause the MGW to modify a termination, the MGW should also check and activate the transcoder when the MGW has received from a media gateway at the other end of a load connection section with a termination in the same context a message to modify the load connection, for example the Q.2630 "Modify Bearer" procedure.

4. In a preferred embodiment of 2, and as an alternative to 3, in the case where the MGC uses the Q.1950 "Reserve Characteristics" procedure to cause the MGW to modify a termination, the MGW should also check and activate the transcoder when the MGW has also received commands from the MGC for modification via the Q.1950 "Reserve Characteristics" procedure or the Q.1950 "Modify Characteristics" procedure for all terminations in the same context.

5. In the case where the MGC uses the Q.1950 "Reserve Characteristics" procedure to cause the MGW to modify a termination, the MGW should only perform the checking and activation of the transcoder when the media gateway at the other end of the load connection section corresponding to the termination signals that the load connection is to be modified:

6. In a preferred embodiment of 5, in the case where the MGC uses the Q.1950 "Modify Characteristics" procedure to cause the MGW to modify a termination, the MGW should only check and activate the transcoder when the MGW has also received commands from the MGC for modification via the Q.1950 "Reserve Characteristics" procedure or the Q.1950 "Modify Characteristics" procedure for all terminations in the same context.

7. In the case where the MGC is jointly modifying a number of terminations belonging to a load connection, where it uses the Q.1950 "Modify Characteristics" procedure for at least two terminations, the MGC should first execute the Modify Characteristics" procedure for all these terminations before it sends the messages "Modify to Selected Codec information" or "Modify Codec" to the media gateways at the other ends of the corresponding load connection sections for Q.1902.4. This case occurs at an MGC which initiates a simultaneous change of the load connection in two or more directions. According to BICC, Q.1902.4, the procedures "Codec Modification" and "Codec Renegotiation" execute independently from this MGC in all directions. The synchronization of these procedures in the initiating MGC is the object of the invention. (see Figure 4)

8. In a Preferred embodiment of 1 to 7, in the MGW after the signaling via the Q.1950 protocol by means of the "Reserve Characteristics" procedure or the Modify Characteristics" procedure that the coding of a specific termination is to be changed, all terminations connected to it in the same "context" are deactivated (H.248 "stream mode"), i.e. the MGW does not direct any load data

from and to these terminations Only the first termination changed goes into the transmit and receive state, i.e. forwards load data from and to the terminations involved in the same "context". Only after the arrival of commands for changing these inactive terminations in accordance with points 1 to 7 will the MGW check in each case whether it can connect the termination(s) in their new coding to each other.

9. In a preferred embodiment of 1 to 8 the MGW cannot immediately establish the connections after the check specified in 1, but first, even if also using additional separate signaling, for example the lu FP initialization specified in 3GPP in TS 25.415 and 29.415, would initiate the changeover of the coding at these terminations with the media gateway at the other ends of the load connection sections to be connected again.

10. In a preferred embodiment of 1 to 9 the MGW cannot activate the relevant termination immediately for load data, i.e. set it to the transmit and receive data state after receiving the command for the change from the MGC, but only if the changeover of the coding is undertaken by a subsequent separate signal, for example the lu FP initialization specified in 3GPP in TS 25.415 and 29.415 with the media gateway at the other end of the load connection section.

11. In a preferred embodiment of 1 and 10 the MGW can restrict the period after arrival of the first command to change a termination until the arrival of the command which initiates the check. If in this period all the relevant commands for all associated load

connections have not arrived, the MGW can again establish the original connection of the load connections with the old coding.

Further features and advantages of the invention are produced by the claims and the subsequent description of an exemplary embodiment on the basis of the drawing. The Figure shows:

Fig. 1 the BICC and CBC message flow on switching over a load connection from one coding to another coding for the case of a pair of MGC and MGW which process and forward a modification of the coding of a load connection initiated by another media gateway,

Fig. 2 the BICC and CBC message flow on switching over a load connection from one coding to another coding for the case of a pair of MGC and MGW which process and forward a modification of the coding of a load connection initiated by another media gateway,

Fig. 3 the BICC and CBC message flow on switching over a load connection from one coding to another coding for the case of a pair of MGC and MGW which itself initiates the modification of an coding of a load connection in the direction of a load connection section,

Fig. 4 the BICC and CBC message flow on switching over a load connection from one coding to another coding for the case of a pair of MGC and MGW which itself initiates the modification of an coding of a load connection in the direction of two load connection sections connected by the MGW,

Fig. 1 shows the BICC and CBC message flow on switching over a load connection from one coding to another coding The case of a pair of MGC and MGW which processes and forwards a modification of the coding of a load data connection initiated by another media gateway is shown.

The corresponding numbers specify the timing sequence of the messages. Messages in the areas delimited by rounded edges each relate to a corresponding termination. For simplification the message flows are only shown for two terminations involved. All further terminations within the connection must be handled in a similar way. The terminations are connected to each other within the MGW and lie in the same "context". Messages 2,3,4,5,7 and 9 are each confirmed by a message in the opposite direction immediately following them.

The BICC procedure "Codec Modification" is shown. With the BICC procedure "Codec Renegotiation", to which the present invention can also be applied, the message flow is identical, but instead of the "Modify Codec" message (1 and 6) the "Modify to Selected Codec information" message is used.

The message flow is used in accordance with the invention as follows:

1. The messages 2 (Q.1950 "Reserve Characteristics") and 5 (Q.1950 "Modify Characteristics") are used unchanged, as described in the protocols. The way that the MGW behaves in relation to these messages changes fundamentally.
2. After the arrival of message 2 the MGW checks whether this message is the first instruction relating to the corresponding "context" which requires a change to the coding. If this condition applies, the MGW deactivates all terminations associated with this termination as well as all terminations in the same "context". The message explicitly defines the desired new coding for the "context".
3. Subsequently (before message 3 is sent) the MGW activates the termination B, i.e. puts this into the transmit and receive load data state.
4. After arrival of message 5, or 7, or 9 the MGW checks whether the new coding of a connection of the terminations A and B is possible. If this is not possible, the MGW sends a corresponding error message in the receive confirmation for 5 or 9. The further error signaling is not shown here.
5. Else the MGW activates termination A again using the new coding (in the case of using message 5 in Point 4 not until the arrival of message 7) and thereby "connects" the terminations A and B.
6. All further inactive terminations not shown here are changed in a similar way.

Fig. 2 shows the BICC and CBC message flow on changeover of a load connection from one coding to another coding The case of a pair of MGC and MGW which processes a modification of the coding of a load connection initiated by another media gateway but does not forward it is shown.

The corresponding numbers specify the timing sequence of the messages. Messages in the areas delimited by rounded edges each

relate to a corresponding termination. Messages 2,3,4 and 5 are each confirmed by a message in the opposite direction immediately following them.

The BICC procedure "Codec Modification" is shown. With the BICC procedure "Codec Renegotiation", to which the present invention can also be applied, the message flow is identical, but instead of the "Modify Codec" message 1 the "Modify to Selected Codec information" message is used.

The message flow is used in accordance with the invention as follows:

1. The message 2 (Q.1950 "Reserve Characteristics") will be used unchanged, as described in the protocols. The way that the MGW behaves in relation to these messages changes fundamentally.
2. After the arrival of message 2, the MGW checks whether this message is the first instruction relating to the corresponding "context" which requires a change to the coding. If this condition applies, the MGW deactivates all terminations associated with this termination as well as all terminations in the same "context". The message explicitly defines the desired new coding for the "context".

3. Subsequently (before message 3 is sent) the MGW activates termination B, i.e. puts this into the transmit and receive load data state.
4. After arrival of message 5 the MGW checks whether the new coding of a connection of terminations A and B is possible. If this is not possible, the MGW sends a corresponding error message in the receive confirmation for 5. The further error signaling is not shown here.
5. Else the MGW, if this is necessary as a result of the different codings at termination A and B, inserts a transcoder and then activates termination A again using the new coding and thereby "connects" terminations A and B.

Fig. 3 shows the BICC and CBC message flow on switching over a load connection from one coding to another coding The case of a pair of MGC and MGW which itself initiates modification of the coding of a load data connection in the direction of a load connection section is shown.

The corresponding numbers specify the timing sequence of the messages. Messages in the areas delimited by rounded edges each relate to a corresponding termination. Messages 1 and 3 are each confirmed by a message in the opposite direction immediately following them.

The BICC procedure "Codec Modification" is shown. With the BICC procedure "Codec Renegotiation", to which the present invention can

also be applied, the message flow is identical, but instead of the "Modify Codec" message 2 the "Modify to Selected Codec information" message is used.

The message flow is used in accordance with the invention as follows:

1. The message 1 (Q.1950 "Modify Characteristics") will be used unchanged as described in the protocols. The way that the MGW behaves in relation to these messages changes fundamentally.
2. After the arrival of message 1 the MGW checks whether this message is the first instruction relating to the corresponding "context" which requires a change to the coding. If this condition applies, the MGW deactivates all terminations associated with this termination as well as all terminations in the same "context". The message explicitly defines the desired new coding for the "context".
3. Subsequently the MGW activates termination A, i.e. puts this into the transmit and receive load data state.
4. After arrival of message 3 the MGW checks whether the new coding of a connection of terminations A and B is possible.
5. Else the MGW, if this is necessary as a result of the different codings at termination A and B, inserts a transcoder and then activates termination B again using the new coding and thereby "connects" terminations A and B.

Fig. 4 shows the BICC and CBC message flow on switching over a load connection from one coding to another coding The case of a pair of MGC and MGW which itself initiates modification of the coding of a load data connection in the direction of two load connection sections connected by the MGW is shown.

The corresponding numbers specify the timing sequence of the messages. Messages 3, 4, 5 and messages 3a, 4a, 5a are executed independently of any other message flow. Messages in the areas delimited by rounded edges each relate to a corresponding termination. For simplification the message flows are only shown for two terminations involved. All further terminations within the connection must be handled in a similar way. The terminations are connected to each other within the MGW and lie in the same "context". Messages 1, 2, 4 and 4a are each confirmed by a message in the opposite direction immediately following them.

The BICC procedure "Codec Modification" is shown. With the BICC procedure "Codec Renegotiation", to which the present invention can also be applied, the message flow is identical, but instead of the "Modify Codec" message (3 and 3a) the "Modify to Selected Codec information" message is used.

The message flow is used in accordance with the invention as follows:

1. Messages 1 and 2 (Q.1950 "Modify Characteristics") are sent by the MGC and confirmed by the MGW before the MGC sends the

messages 3 and 3a (Q.1902.4 "Modify Codec). According to Q.1902.4 the only requirement is for the MGC to send message 1 before message 3 and message 2 before message 3a.

2. Messages 1 and 2 (Q.1950 "Modify Characteristics") are used unchanged, as described in the protocols. The way that the MGW behaves in relation to these messages changes fundamentally.
3. After the arrival of message 1, the MGW checks whether this message is the first instruction relating to the corresponding "context" which requires a change to the coding. If this condition applies, the MGW deactivates all terminations associated with this termination as well as all terminations in the same "context". The message explicitly defines the desired new coding for the "context".
4. Subsequently the MGW activates termination A, i.e. puts this into the transmit and receive load data state.
5. After arrival of message 2, or 4, or 4a, the MGW checks whether in the new coding a connection of the terminations A and B is possible.
6. The MGW activates termination B again using the new coding (in the case of use of message 2 in Point 5 only after arrival of message 4a) and thereby "connects" terminations A and B.
7. All further inactive terminations not shown here are changed in a similar way.